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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/901,611	Applicant(s) ELBER, GERSHON	
	Examiner Lance W. Sealey	Art Unit 2671	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 June 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-50* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8,10-23, 25-26 and 28-50* is/are rejected.

7)☒ Claim(s) *9,24 and 27* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Allowable Subject Matter

1. Claims 9 and 27 are allowable because no prior art suggests or implies, in a graphical data-compressor, using either Bezier freeform functions, B-spline freeform functions, NURBS, piecewise polynomial equations or rational equations to fit an input surface consisting of a plurality of data points in space into a format suitable for an analyzer which analyzes arbitrary graphical data into constituent geometrical parts.

2. Claim 24 is allowable because no prior art suggests or implies each predetermined shape and form in said set as trimmable with a further predetermined shape and form from said set (Simons et al., U.S. Pat. No. 6,320,595, "Simons," discloses, at col.3, ll.29-37—the apparatus that breaks an image into its constituent objects. Objects like circles and polygons are "shapes", and objects like lines and points are "forms".). Since a single point cannot be trimmable, there is no prior art that can be reasonably applied that can disclose each predetermined shape and form as trimmable.

Claim Rejections - 35 USC § 102

3. The following is a quotation of 35 U.S.C. 102(e) which forms the basis for all novelty-related rejections set forth in this Office action:

A person shall be entitled to a patent unless—
the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by applicant for patent.

4. Claims 25-26 and 32 are rejected under 35 U.S.C. 102(e) as being anticipated by Simons.

5. With respect to claim 25, Simons discloses an analytic form describer for describing constituent geometrical parts (objects, col.3, l.31) of arbitrary graphical data (image, col.3, l.31) as an analytic description, said analytic form describer comprising a register of predetermined shapes and forms (col.3, l.32—Objects like circles and polygons are "shapes", and objects like lines and points are "forms") and an analytic form fitter for associating said predetermined shapes and forms with said geometrical parts ("component object specification," col.3, ll.30-32). Both the analytic form describer and the analytic form fitter are in the encoder **42**, FIG.7.

6. Concerning claim 26, Simons discloses said predetermined basic geometrical elements selected from a group comprising lines, circles, planar surfaces, spherical surfaces, conical surfaces, cylindrical surfaces, torroidal surfaces, surfaces of revolution, ruled surfaces, extrusion surfaces and sweep surfaces (col.3, l.32—Objects like circles and polygons are "shapes", and objects like lines and points are "forms").

7. Regarding claim 32, Simons discloses a method for compressing arbitrary graphical data, comprising analyzing said arbitrary graphical data into constituent geometric parts, where at least some of said constituent geometric parts comprise predetermined shapes and forms (col.3, ll.29-37—the apparatus that breaks an image into its constituent objects. Objects like circles and polygons are "shapes", and objects like lines and points are "forms".), describing said constituent

geometrical parts as functional description of said constituent geometrical parts of said arbitrary graphical data, where said functional description comprises a high level functional form representing at least one of said constituent geometrical parts ("component object specification," col.3, ll.30-32), and transmitting said functional description (col.3, ll.37-39).

8. Therefore, in view of the foregoing, claims 25-26 and 32 are rejected as anticipated under 35 U.S.C. 102(e) by Simons.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claims 1-8, 10-11, 13-15, 28-29, 31 and 46 are rejected under 35 U.S.C. § 103(a) as being unpatentable by Deering (U.S. Pat. No. 6,525,722) in view of Simons.

11. Deering, in disclosing geometry compression for mesh structures, also discloses, with respect to claim 1, a graphical data-compressor for compression of received, arbitrary graphical data for subsequent transmission (col.3, ll.37-40 and col.4, ll.42-46); said graphical data-compressor comprising

an input for reception of said received arbitrary graphical data (3D graphics source **10**, FIG.4), and

a transmitter linked to said functional scene describer for transmission of said analytic description (network interface **110**, FIG.4).

12. However, Deering does not disclose an analyzer linked to said output and operable for analysis of said received arbitrary graphical data into constituent geometrical parts, where at least some of said constituent geometric parts comprise predetermined shapes and forms, and a scene describer, linked to said analyzer for description of said at least some of said constituent geometrical parts as a functional description of said received arbitrary graphical data, where said functional description comprises a high level functional form representing one of said constituent geometrical parts. These elements are disclosed by the Simons graphic image generation and coding method. Simons discloses an analyzer linked to said input and operable for analysis of said received arbitrary graphical data into constituent geometrical parts where at least some of said constituent geometric parts comprise predetermined shapes and forms (col.3, ll.29-37—the apparatus that breaks an image into its constituent objects. Objects like circles and polygons are "shapes", and objects like lines and points are "forms".). Simons also discloses a scene describer, linked to said analyzer for description of at least some of said constituent geometrical parts as a functional description of said received arbitrary graphical data, where said functional description comprises a high level functional form representing one of said constituent geometric parts ("component object specification," col.3, ll.30-32). Both the analyzer and the scene describer are part of the encoder **42**, FIG.7.

13. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the Deering geometry compression method in view of the Simons graphic image generation and coding method by replacing the process at step **874**, FIG.5 of Deering with the Simons analyzer process. This would permit the direct transmission of graphic images to hand-held or mobile devices (Simons, col.3, ll.29-30).

14. Regarding claim 2, since the applicants on p.12 of the specification defined indexing as a label of an underlying shape and parameters for adapting said underlying shape to reconstruct an original shape, and it is obvious to identify parts of compressed data that need to be restored at decompression time before compression occurs, Deering must disclose indexing between step **874** and steps **876/878**, FIG.5, and these steps occur before transmission (step **884**).

15. Concerning claim 3, Deering discloses arbitrary graphical data in a format selected from a polygonal graphic representation, a point cloud, an ordered piecewise mesh, or (piecewise) polynomial and rational forms and polynomial, rational and freeform functions (ordered piecewise mesh; FIG.1).

16. Regarding claim 4, Simons discloses said analyzer for analysis of said graphical data into constituent geometrical parts comprising a pattern matcher matching with a predetermined shape (The "pattern matching" occurs in the sense that the encoding of component object data consists of every object to be drawn having a command word associated with it; see col.4, ll.31-33. Each command word has a selectable attribute that tells the renderer how it will render that object; see

col.4, ll.62-64. A user seeking to have an object rendered would graphically select that object to be rendered based on a bit in that command word; see col.4, l.62 to col.5, l.4.)

17. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the Deering geometry compression method in view of the Simons graphic image generation and coding method by replacing the process at step **874**, FIG.5 of Deering with the Simons analyzer process. This would permit the direct transmission of graphic images to hand-held or mobile devices (Simons, col.3, ll.29-30).

18. With respect to claim 5, Deering discloses said constituent geometrical part is a predetermined shape (see rejection of claim 4 above), and said analytic description comprises a functional representation of said predetermined shape ("regularly tiled surface portion to be represented as a vertex raster," col.35, ll.9-11. Note that this functional representation includes both the predetermined shape ("regularly tiled surface portion") and how the predetermined shape will look after it has been compressed ("vertex raster")).

19. Concerning claim 6, Deering discloses said functional representation (col.35, ll.9-11) as comprising a basic underlying shape (compressed form of regularly tiled surface portion) together with parameters (connectivity information; col.35, ll.32-35).

20. Regarding claim 7, Deering discloses said received arbitrary input data comprising a plurality of data points in space (an ordered piecewise mesh, FIG.1, can reasonably be characterized as a plurality of data points in space).

21. Concerning claim 8, Deering does not explicitly disclose an applicator for applying a surface fitting function to fit said plurality of data points in space in order to represent said plurality of data points in a format suitable for said analyzer. However, it would have been obvious to a person skilled in the art at the time the invention was made that such an applicator would exist because, as stated above, the Deering equivalent of the applicant's analyzer decides which parts of the graphical data constitute a regular or irregular surface (**874**, FIG.5). Deering also sets forth what constitutes a surface (col.9, ll.41-45). It is therefore obvious that the Deering equivalent of the applicant's applicator must be the element that applies the Deering rule of what constitutes a surface, and that rule is a surface fitting function.

22. With respect to claim 10, Deering discloses said predetermined shape as being selected from any one of a group comprising lines, curves, planar freeform surfaces, surfaces of revolution, spherical faces, conical faces, cylindrical faces, torroidal faces, ruled surfaces, extrusion surfaces, sweep surfaces, additive combinations thereof and trimmed combinations thereof (planar freeform surfaces, referred to by Deering as "irregular surfaces," col.10, ll.9-12).

23. Concerning claim 11, Deering discloses said scene describer operable to select said predetermined shape for said constituent geometrical part by analysis of said constituent geometric part to determine fulfillment of conditions associated with said predetermined shape (Deering decides if the constituent geometrical part (portion of the input arbitrary graphical data) is a regular or irregular surface (predetermined shape) by checking to see if the condition of a

regular arrangement of vertices defining the polygons used in the mesh is fulfilled; see col.9, ll.47-49).

24. With respect to claims 13 and 41, Deering discloses said functional description as comprising at least a label of an underlying shape (underlying shape is compressed form of regularly tiled surface portion—see col.35, ll.9-11--and label is vertex extent; see col.35, ll.19-21) and parameters for adapting said underlying shape to reconstruct an original shape (connectivity information in the vertex raster, col.35, ll.32-35, is used to decompress the compressed data back to its original shape—see step 1948, FIG.43).

25. Concerning claim 14, Deering discloses said parameters comprising at least one of a group comprising an orientation, a scale, dimensional parameters and a location (col.36, ll.24-27).

26. Regarding claim 15, Deering discloses said label (vertex extent) as an index (col.35, ll.11-12).

27. Regarding claim 28, Deering discloses a system for analysis, compression, transmission and decompression of arbitrary graphical data, the system comprising:

a graphical data-compressor for compression of received, arbitrary graphical data, said graphical data-compressor comprising:

an input for reception of arbitrary graphical data (3D graphics source **10**, FIG.4),

a transmitter, linked to said analyzer, for transmission of said analytical description over a data link (network interface **110**, FIG.1),

said system further comprising a graphical data decompressor for decompression of said functional description into geometric entities, the decompressor comprising:

a receiver for reception of said functional description from said data link, and a geometry evaluator for evaluating said functional description in terms of basic geometric shapes, thereby to decompress said compressed graphical data descriptions (network interface **120**, FIG.1); and a geometry evaluator, following said receiver, for evaluation of said graphical data in respect of a predetermined set of basic shapes stored at said decompressor (inherent that this would be in the GDU **1910**, FIG.42; see step **1932**, FIG.43 and col.45, ll.17-26).

28. However, Deering does not disclose an analyzer linked to said output and operable for analysis of said received arbitrary graphical data into constituent geometrical parts, where at least some of said constituent geometric parts comprise predetermined shapes and forms, and a scene describer, linked to said analyzer for description of said at least some of said constituent geometrical parts as a functional description of said received arbitrary graphical data, where said functional description comprises a high level functional form representing one of said constituent geometrical parts. These elements are disclosed by the Simons graphic image generation and coding method. Simons discloses an analyzer linked to said input and operable for analysis of said received arbitrary graphical data into constituent geometrical parts where at least some of

said constituent geometric parts comprise predetermined shapes and forms (col.3, ll.29-37—the apparatus that breaks an image into its constituent objects. Objects like circles and polygons are "shapes", and objects like lines and points are "forms".). Simons also discloses a scene describer, linked to said analyzer for description of at least some of said constituent geometrical parts as a functional description of said received arbitrary graphical data, where said functional description comprises a high level functional form representing one of said constituent geometric parts ("component object specification," col.3, ll.30-32).

29. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the Deering geometry compression method in view of the Simons graphic image generation and coding method by replacing the process at step **874**, FIG.5 of Deering with the Simons analyzer process. This would permit the direct transmission of graphic images to hand-held or mobile devices (Simons, col.3, ll.29-30).

30. Regarding claim 29, Deering does not explicitly disclose an indexer positioned between said analyzer and said transmitter for indexing said analytic description into an indexed description. However, its existence is at least obvious for the same reason that the scene describer is at least obvious. It is in fact reasonable to assume that the scene describer and the indexer are two parts of the same structure: the scene describer is a label that identifies a surface as being regular or irregular, and the indexer is the physical position of the label.

31. Concerning claim 31, Deering discloses said data link selected from a group comprising a LAN, WAN, the Internet, a dedicated land link, a dedicated link through the atmosphere, a radio-wave link, and a microwave link (networks **30**, FIG.4; applicants have listed common networks, and it is apparent by the Deering mention of "networks" that Deering also meant to disclose transmission over common networks).

32. With respect to claim 46, Deering discloses a graphical data-compressor for compression of received, arbitrary graphical data for subsequent transmission (col.3, ll.37-40 and col.4, ll.42-46); said graphical data-compressor comprising

an input for reception of said received arbitrary graphical data (3D graphics source 10, FIG.4),

an analyzer linked to said input and operable for analysis of said received arbitrary graphical data into constituent geometrical parts (contained within 3-D graphics compression unit 60, FIG.4, the Deering equivalent to the analyzer decides which parts of the graphical data constitute a regular or irregular surface; **874**, FIG.5. Once the type of surface is determined, it is inherent that the compression method is known; see col.10, ll.1-15),

a scene describer, linked to said analyzer for description of at least some of said constituent geometrical parts as a functional description of said received arbitrary graphical data (not explicitly disclosed, but inherent because once the analyzer decides which parts of the graphical data constitute a regular or irregular surface, there needs to be a way to actually label

the surfaces as regular or irregular for the purpose of setting aside different surfaces for different compression methods, namely compressing using the vertex raster format (step **876**, FIG.5) and

a geometrical part compressor operatively associated with said scene describer and said analyzer, for reduction of constituent geometric parts not described by said describer, into a reduced quantity of data (3-D graphics compression **60**, FIG.4).

33. Accordingly, in view of the foregoing, claims 1-8, 10-11, 13-15, 28-29, 31 and 46 have been rendered unpatentable under 35 U.S.C. 103(a) by Deering and Simons.

34. Claim 12 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Deering in view of Simons and further in view of Go (U.S. Pat. No. 6,101,277).

35. Neither Deering nor Simons explicitly discloses the predetermined shape modifiable by trimming. However, this element is disclosed by the Go image encoding and decoding method at col.17, l.66 to col.18, l.24.

36. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the Deering-Simons geometry compression method in view of the Go image encoding and decoding method by placing the Go reduced image encoder **25** (FIG.1) in the Deering 3-D graphics compression **60** (FIG.4). Such a modification would enable edges to be encoded more efficiently (Go, col.18, ll.19-20).

37. Accordingly, in view of the foregoing, claim 12 has been rendered unpatentable under 35 U.S.C. 103(a) by Deering, Simons and Go.

38. Claims 16-23, 30 and 43-45 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Deering in view of Simons and further in view of Kono (U.S. Pat. No. 4,772,947).

39. With respect to claim 16, Deering discloses a graphics decompressor comprising a receiver for reception of graphical data in a compressed, functional form (geometry decompression unit ("GDU") **1910**, FIG.42).

40. However, Deering does not disclose a geometry evaluator, following said receiver, for evaluation of said graphical data in respect of a predetermined set of basic shapes and forms stored at said decompressor. These elements are disclosed by Simons (objects like circles and polygons are "shapes", and objects like lines and points are "forms"—see col.3, ll.29-32).

41. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the Deering geometry compression method in view of the Simons graphic image generation and coding method by replacing the process at step **874**, FIG.5 of Deering with the Simons geometry evaluator process. This would permit the direct transmission of graphic images to hand-held or mobile devices (Simons, col.3, ll.29-30).

42. However, neither Deering nor Simons disclose a piecewise linear surface approximator following said geometry evaluator for reconstruction of said evaluated data on a piecewise basis, into geometrical entities. This is disclosed by the Kono method and apparatus for transmitting compressed data (col.2, l.66 to col.3, l.48, especially col.3, ll.4-31).

43. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the Deering-Simons geometry compression method in view of the Kono method by inserting the Kono reconstruction unit **15** (FIG.1) in the Simons encoder **42** (FIG.7). Such a modification would allow for smaller compression of each geometrical entity, thereby allowing for more data to be transmitted at a time (Kono, col.11, ll.1-16).

44. Concerning claims 17 and 43, Deering discloses said compressed functional form (col.35, ll.9-11) as comprising elements having a basic shape (compressed form of regularly tiled surface portion) associated with parameters (connectivity information; col.35, ll.32-35). Decompressing a functional description of graphical data is accomplished by GDU **1910**, FIG.42. Evaluating said functional description in terms of said plurality of basic geometrical shapes is disclosed at col.45, ll.17-22, especially ll.20-22 (Deering has consistently taught the existence of regular and irregular surfaces—see **874**, FIG.5. These are "a plurality of basic geometrical shapes." Furthermore, it would have been obvious to a person skilled in the art at the time the invention was made that evaluation would occur according to more than one shape; otherwise Deering, in explaining step **1932** in a process of decompression (FIG.43), would not have bothered to bring up the idea of the extent value indicating "the shape of a surface portion" (col.45, l.22)). Finally, col.48, l.36 states that the flowchart in FIG.43 produces a primitive, which is a "geometric entity.")

45. Regarding claims 18-20, Deering discloses a graphics decompressor wherein said reconstruction into geometrical entities is at a selectable resolution level, and said resolution level is selectable in accordance with a context of the data within a scene, said context being a relationship of the data to a background and a foreground within the scene (col.49, ll.55-57; col.43, ll.38-48).

46. With respect to claims 21-22, Deering does not explicitly disclose said selectable resolution level being determinable by available computer resources, said available computer resources being any one of a group comprising memory availability, processor capability, and available processing time. However, it would be obvious to a person skilled in the art at the time the invention was made that any computer-driven operation would be determinable by the availability of any computer resource, including memory or processor availability or available processing time.

47. Concerning claim 23, Deering discloses said predetermined shape as being selected from any one of a group comprising lines, curves, planar freeform surfaces, surfaces of revolution, spherical faces, conical faces, cylindrical faces, torroidal faces, ruled surfaces, extrusion surfaces, sweep surfaces, additive combinations thereof and trimmed combinations thereof (planar freeform surfaces, referred to by Deering as "irregular surfaces," col.10, ll.9-12).

48. With respect to claims 30 and 44, Kono discloses a piecewise linear surface approximator in a decompressor (col.10, ll.13-46).

49. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the Deering-Simons geometry compression method in view of the Kono method by inserting the Kono reconstruction unit **15** (FIG.1) in the Simons encoder **42** (FIG.7). Such a modification would allow for smaller compression of each geometrical entity, thereby allowing for more data to be transmitted at a time (Kono, col.11, ll.1-16).

50. With respect to claim 45, Kono discloses converting said piecewise linear surface approximation into polygonal geometry (col.10, ll.13-46; in reconstructing luminance values for each block, Kono aids in reconstructing individual (four-sided) blocks, which are polygons).

51. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the Deering-Simons geometry compression method in view of the Kono method by inserting the Kono reconstruction unit **15** (FIG.1) in the Simons encoder **42** (FIG.7). Such a modification would allow for smaller compression of each geometrical entity, thereby allowing for more data to be transmitted at a time (Kono, col.11, ll.1-16).

52. Accordingly, in view of the foregoing, claims 16-23, 30 and 43-45 have been rendered unpatentable under 35 U.S.C. 103(a) by Deering, Simons and Kono.

53. Claims 33-39 and 41-42 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Simons in view of Deering.

54. Regarding claim 33, since the applicants defined indexing as a label of an underlying shape and parameters for adapting said underlying shape to reconstruct an original shape, and it is obvious to identify parts of compressed data that need to be restored at decompression time, Simons discloses indexing at col.3, ll.29-37—the apparatus that breaks an image into its constituent objects.

55. Concerning claim 34, Simons does not disclose arbitrary graphical data in a format selected from a polygonal graphic representation, a point cloud, an ordered piecewise mesh, or (piecewise) polynomial and rational forms and polynomial, rational and freeform functions. However, Deering discloses these elements (ordered piecewise mesh; FIG.1).

56. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the Simons encoder **42** (FIG.7) to add the capability of the Deering 3-D graphics compressor **60** (FIG.4). Such a modification would allow for the compression/decompression of both regularly and irregularly tiled surfaces (Deering, col.3, ll.21-23).

57. Regarding claims 35 and 38, Simons discloses said analyzer for analysis of said graphical data into constituent geometrical parts comprising a pattern matcher matching with a predetermined shape (The "pattern matching" occurs in the sense that the encoding of component object data consists of every object to be drawn having a command word associated with it; see col.4, ll.31-33. Each command word has a selectable attribute that tells the renderer how it will

render that object; see col.4, ll.62-64. A user seeking to have an object rendered would graphically select that object to be rendered based on a bit in that command word; see col.4, l.62 to col.5, l.4.)

58. With respect to claim 36, Simons discloses said constituent geometrical part is a predetermined shape (col.3, ll.29-37—the apparatus that breaks an image into its constituent objects. Objects like circles and polygons are "shapes", and objects like lines and points are "forms".), and said analytic description comprises a functional representation of said predetermined shape ("component object specification", col.3, ll.30-32).

59. Regarding claim 37, it is at least obvious that when Simons discloses said received arbitrary input data (image, col.3, l.31), the arbitrary image data comprises a plurality of data points in space.

60. With respect to claim 39, Simons discloses said predetermined shape as being selected from any one of a group comprising lines, curves, planar freeform surfaces, surfaces of revolution, spherical faces, conical faces, cylindrical faces, torroidal faces, ruled surfaces, extrusion surfaces, sweep surfaces, additive combinations thereof and trimmed combinations thereof (lines--col.3, l.32).

61. With respect to claim 41, Simons discloses said functional description as comprising at least a label of an underlying shape ("component object description," col.3, ll.30-32) and

parameters for adapting said underlying shape to reconstruct an original shape (col.5,ll.16-36— "underlying shape" is compressed state of image, "original shape" is decompressed image).

62. Concerning claim 42, Simons discloses encoding further comprising labeling with a label selected from a predetermined index of labels (col.5, ll.30-32).

63. Accordingly, in view of the foregoing, claims 33-39 and 41-42 have been rendered unpatentable under 35 U.S.C. 103(a) by Simons and Deering.

64. Claim 40 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Simons in view of Deering and further in view of Go (U.S. Pat. No. 6,101,277).

65. Neither Simons nor Deering explicitly discloses the predetermined shape modifiable by trimming. However, this element is disclosed by the Go image encoding and decoding method at col.17, l.66 to col.18, l.24.

66. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the Simons-Deering geometry compression method in view of the Go image encoding and decoding method. Such a modification would enable edges to be encoded more efficiently (Go, col.18, ll.19-20).

67. Accordingly, in view of the foregoing, claim 40 has been rendered unpatentable under 35 U.S.C. 103(a) by Simons, Deering and Go.

68. Claims 47-48 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Deering in view of Simons and further in view of Lyche et al., "Knot removal for parametric B-spline curves and surfaces" ("Lyche").

69. Although Derring discloses a geometrical part compressor, neither Deering nor Simons disclose, with respect to claim 47, a geometrical part expressable as at least one spline having knots and a knot remover for identifying and removing knots having no effect on reproduction of the part. However, these elements are disclosed, directly or indirectly, by Lyche.

70. The first paragraph of Section 2, "Coefficient norms for B-spline curves and surfaces," on p.218 discloses a parametric B-spline curve with knots. Knot removal is disclosed in the third paragraph of the same section. Item 10 on p.229 states that knot removal can be applied to data compression.

71. Lyche does not address the issue of reproduction of the geometric part. However, since Deering discloses lossless compression at col.9, ll.6-8, this element is disclosed as well.

72. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the Deering-Simons geometry compression method in view of the Lyche discussion on knot removal. Such a modification would minimize storage usage by storing polygons with fewer points (Lyche, Item 10, p.229).

73. Concerning claim 48, Lyche discloses a pattern identifier for identifying patterns of knots (which knots are most significant in representing the spline where the knots reside; see "3. Knot

removal for parametric B-spline curves," fourth paragraph, pp.220-221) and an indexer for replacing each identified pattern with an index (weights are used as indexes to indicate the significance of a knot; see "3. Knot removal for parametric B-spline curves," fourth paragraph, pp.220-221).

74. Accordingly, in view of the foregoing, claims 47-48 have been rendered unpatentable under 35 U.S.C. 103(a) by Deering, Simons and Lyche.

75. Claim 49 is rejected under 35 USC § 103(a) as being unpatentable over Deering in view of Simons and further in view of Demmel, Applied Numerical Linear Algebra.

76. Neither Deering nor Simons disclose a least squares approximator reducing said geometrical part into a least squares approximation. However, this is disclosed by the Demmel linear algebra textbook example at pp.114-117.

77. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the Deering-Simons geometry compression method in view of Demmel's application to a linear algebra theorem to compression. Such a modification would minimize storage usage by permitting storage of many fewer numbers in the compression process (Demmel, p.114 before first full paragraph).

78. Accordingly, in view of the foregoing, claim 49 has been rendered unpatentable under 35 U.S.C. 103(a) by Deering, Simons and Demmel.

Claim Rejection - 35 USC § 112

79. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

80. Claim 50 recites the limitation "said object". There is insufficient antecedent basis for this limitation in the claim. Appropriate correction is required. If not for this rejection, claim 50 would be allowable because no prior art suggests or implies, in an analyzer for a graphical data-compressor that analyzes arbitrary graphical data into constituent geometrical parts, a reducer for reducing an object to give a minimal polynomial degree required for correct reproduction of said parts.

Response to Remarks

81. Pages 14-18 and 21-22 of the applicants' remarks argue that Deering does not disclose at least some of said constituent geometric parts comprising predetermined shapes and forms, a register of predetermined shapes and forms, associating said predetermined shapes and forms with said geometrical parts, and a scene describer which features a functional description that comprises a high level functional form representing one of said constituent geometrical parts. However, these elements are disclosed by Simons, as described in the above rejections.

82. The applicants next assert, on p.18, that (1) Go does not teach the modification of a predetermined shape by trimming as required by dependent claims 12 and 40; and (2) Go does not teach trimmed combinations of predetermined basic geometrical elements, as required by claim 26. However, with respect to (1), Go does teach trimming, and both Deering and Simons

teach modification of a predetermined shape, and with respect to (2), (a) it is not necessary for a reference to disclose trimmed combinations of predetermined basic geometrical elements to fulfill claim 26. Claim 26 only requires that a predetermined shape or form be either a line or a circle or a planar surface or a spherical surface or a conical surface or a cylindrical surface or a torroidal surface or a surface of revolution or a ruled surface or an extrusion surface or a sweep surface or additive or trimmed combinations thereof; and (b) Simons, not Go, is now being used to teach claim 26.

83. After that, the applicants contend that Lyche fails to teach the removal of knots having no effect on the reproduction of a geometrical part, an element of claim 47. As the applicants point out, Lyche teaches a three-step method entailing a ranking function measuring the significance of a knot in representing a spline and approximate and remove function to determine the maximum number of knots that can be removed such that the corresponding spline approximation yields an error smaller than a given tolerance. However, the setting of an error tolerance is merely a reflection of what risk of error in reproduction the error tolerance setter is willing to tolerate. Lyche teaches a minimal error tolerance; the applicants teach no error tolerance. Therefore, since it would be obvious to simply manipulate the error tolerance level invented by Lyche to tolerate no error in reproduction, claim 47 is unpatentable.

84. Next, the applicants assert, regarding claim 48, that Lyche does not teach a pattern identifier for identifying patterns of knots and an indexer for replacing each identified pattern

with an index. However, with respect to the "pattern identifier" limitation, the section labeled "3. Knot removal for parametric B-spline curves" on pp.220-223 describes an algorithm that identifies a pattern of knots ("3. Knot removal for parametric B-spline curves, fourth paragraph—"The first step towards solving the problem is to assign a weight w^i_j to each component f^i at each interior knot t_j of t.") In order for such a weight to be assigned, an association—or *pattern*—has to be identified between knots and components. Lyche discloses the "indexer" limitation in the seventh sentence of first full paragraph of p.221: "To each knot t_j, we assign a *ranking number*...". The "ranking number" is an index. Therefore, the rejection of claim 48 is upheld.

85. After that, the applicants argue that, with respect to claim 49, Demmel teaches only compression of the entire image. However, it is obvious that Demmel could be changed to compress part of an image by changing the m and n values, which represent the dimensions of the entire image, in EXAMPLE 3.4 on p.114 so that only part of the image is compressed. Therefore, the rejection of claim 49 still stands.

86. On the second half of p.22, with respect to claim 16, the applicants assert that Kono does not teach a piecewise linear surface approximator for reconstruction of evaluated data on a piecewise basis into geometrical entities. The examiner apologizes for not giving a more specific explanation for how Kono meets these claim limitations:

- "piecewise": Col.2, ll.66-68—"The distribution of all the luminance values of the pixels contained *in one block* (italics added by examiner) can be approximately expressed by the coordinates (x,y) shown in FIG.3."
- "linear surface": Col.3, l.20: a flat plane is a linear surface.
- "approximator": Col.2, ll.66-68—"The distribution of all the luminance values of the pixels contained in one block can be *approximately* (italics added by examiner) expressed by the coordinates (x,y) shown in FIG.3."
- "for reconstruction": Reconstruction occurs later, block by block, in col.4, ll.23-31.
- "of evaluated data": Approximation (col.2, l.66 to col.3, l.36) is a type of evaluation.
- "into geometrical entities": Kono gives an example of what constitutes a block in col.5, ll.59-60: seven pixels on a straight line. Thus, a block is a rectangle.
- "on a piecewise basis": Reconstruction occurs later, block by block, in col.4, ll.23-31.

Since Kono meets every claim limitation the applicants were concerned about in claim 16, and, as stated before, Simons meets the "high level functional forms" limitation of claim 16, the rejection of claim 16 is maintained.

87. Finally, with respect to claim 31, Chen has been withdrawn because, as explained in the rejection of claim 31 above, Deering fulfills claim 31.

Conclusion

Any inquiry concerning this communication or earlier communications from the Office should be directed to the examiner, Lance Sealey, whose telephone number is (571) 272-7649. He can be reached Monday-Friday from 7:00 am to 3:30 pm EDT.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Zimmerman, can be reached at (703) 272-7653.

Any response to this action should be mailed to:

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Hand-delivered responses should be brought to the Edmund Randolph Building, 401 Dulany Street, Ground Floor Customer Service Window, Alexandria, VA 22314.

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